

Human Factors Virtual Analysis Techniques for NASA's Space Launch System Ground Support using MSFC's Virtual Environments Lab (VEL)

Using virtual environments to assess complex large scale human tasks provides timely and cost effective results to evaluate designs and to reduce operational risks during assembly and integration of the Space Launch System (SLS). NASA's Marshall Space Flight Center (MSFC) uses a suite of tools to conduct integrated virtual analysis during the design phase of the SLS Program. Siemens Jack is a simulation tool that allows engineers to analyze human interaction with CAD designs by placing a digital human model into the environment to test different scenarios and assess the design's compliance to human factors requirements. Engineers at MSFC are using Jack in conjunction with motion capture and virtual reality systems in MSFC's Virtual Environments Lab (VEL). The VEL provides additional capability beyond standalone Jack to record and analyze a person performing a planned task to assemble the SLS at Kennedy Space Center (KSC). The VEL integrates Vicon Blade motion capture system, Siemens Jack, Oculus Rift, and other virtual tools to perform human factors assessments. By using motion capture and virtual reality, a more accurate breakdown and understanding of how an operator will perform a task can be gained. By virtual analysis, engineers are able to determine if a specific task is capable of being safely performed by both a 5% (~5ft) female and a 95% (~6'1) male. In addition, the analysis will help identify any tools or other accommodations that may help complete the task. These assessments are critical for the safety of ground support engineers and keeping launch operations on schedule. Motion capture allows engineers to save and examine human movements on a frame by frame basis, while virtual reality gives the actor (person performing a task in the VEL) an immersive view of the task environment. This presentation will discuss the need of human factors for SLS and the benefits of analyzing tasks in NASA MSFC's VEL.